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IS 12262 (1988): Trapezoidal steel wires for spring washers
[MTD 4: Wrought Steel Products]

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(Reaffirmed 2001)

Indian Standard

SPECIFICATION FOR TRAPEZOIDAL STEEL WIRE FOR SPRING WASHERS

Wrought Steel Products Sectional Committee, SMDC 5; Panel for Steel Wire, SMDC 5/38 [Ref : Doc : SMDC 5 (3037)]

1. Scope — This standard covers the requirements for steel wire in trapezoidal shape to be used in the manufacture of spring washers.

2. Supply of Material — General requirements relating to supply of material shall conform to IS : 8910-1978 'General technical delivery requirements for steel and steel products'.

3. Manufacture — The wire shall be drawn from steel manufactured by open hearth, electric, duplex, basic oxygen or a combination of these processes. In case any other process is employed by the manufacturer, prior approval of the purchaser shall be obtained.

4. Chemical Composition — Ladle analysis of steels when analysed either by the method specified in the relevant parts of IS : 228 'Methods for chemical analysis of steels', or any other instrumental/chemical method, shall be as given below. In case of dispute, the procedure given in IS : 228 and its relevant parts shall be the 'referee method'.

Grade	*Designation*	*Constituent*, Percent				
		Carbon	Silicon	Manganese	Sulphur *Max*	Phosphorus *Max*
Grade 1	65C6	0·60 to 0·70	0·10 to 0·35	0·50 to 0·80	0·050	0·050
Grade 2	70C6	0·65 to 0·75	0·10 to 0·35	0·50 to 0·80	0·050	0·050

4.1 *Product Analysis* — The permissible variation in case of product analysis from the limits specified in **4** shall be as follows:

Constituent	*Permissible Variation Over the Specified Limits*, Percent
Carbon	± 0·03
Silicon	± 0·03
Sulphur	+ 0·005
Phosphorus	+ 0·005
Manganese	± 0·03

Note — Variations shall not be applicable both over and under the specified limits in several determinations in a heat.

5. Freedom from Defects — The wire shall be well and cleanly drawn to the specified dimensions. The surface of the wire shall be smooth, reasonably free from rust, die marks, scratches, seams, pits and other defects which may affect the fabrication of the finished parts or their serviceability.

6. Sizes and Size Tolerances — Sizes and tolerances on dimensions of wire shall be as specified in Table 1.

6.1 Wire may be supplied in other sizes also as agreed to between the contracting parties.

7. Sectional Code — Standard sectional codes for corresponding washer sizes shall be as given in Table 1.

8. Shape — Shape of the cross section of the wire shall be as given in Fig. 1.

Adopted 5 January 1988

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

TABLE 1 DIMENSIONS AND DIMENSIONAL TOLERANCES

(*Clauses* 6 *and* 7)

All dimensions in millimetres.

Nominal Size of Wire	Dimensions and Dimensional Tolerances						Corresponding Nominal Size of Washer*
	a		*b*		*c*		
	Dimension	Tolerance	Dimension	Tolerance	Dimension	Tolerance	
0·9 × 0·5	0·45	± 0·1	0·90	± 0·1	0·55	± 0·1	2
1·0 × 0·6	0·55	± 0·1	1·00	± 0·1	0·65	± 0·1	2·2, 2·5
1·3 × 0·8	0·70	± 0·1	1·30	± 0·1	0·85	± 0·1	3·0 (3·5)
1·5 × 0·9	0·75	± 0·1	1·50	± 0·1	0·95	± 0·1	4
1·8 × 1·2	1·05	± 0·1	1·80	± 0·1	1·35	± 0·1	5
2·5 × 1·6	1·45	± 0·1	2·50	± 0·15	1·75	± 0·1	6 (7)
3·0 × 2·0	1·70	± 0·1	3·00	± 0·15	2·15	± 0·1	8
3·5 × 2·20	2·00	± 0·15	3·50	± 0·20	2·35	± 0·15	10
4·0 × 2·5	2·15	± 0·15	4·00	± 0·20	2·60	± 0·15	12
4·5 × 3·0	2·70	± 0·15	4·50	± 0·20	3·20	± 0·15	(14)
5·0 × 3·5	3·20	± 0·20	5·00	± 0·20	3·70	± 0·20	16 (18)
6·4 × 4·0	3·70	± 0·20	6·00	± 0·20	4·20	± 0·20	20 (22)
7·0 × 5·0	4·60	± 0·20	7·00	± 0·25	5·30	± 0·20	24, 26 (27)
8·0 × 6·0	5·40	± 0·20	8·00	± 0·25	6·50	± 0·20	30 (33)

Note 1 — Corner radius, *r* should be mutually agreed to between the contracting parties.

Note 2 — Corresponding nominal sizes of washers are indicated in last column sizes given in parantheses are of second perference.

**See* IS : 3063-1972 'Specification for single coil-rectangular section spring washers for bolts, nuts and screws (*first revision*)' and IS : 6755-1980 'Specification for double coil helical spring washers (*first revision*)'.

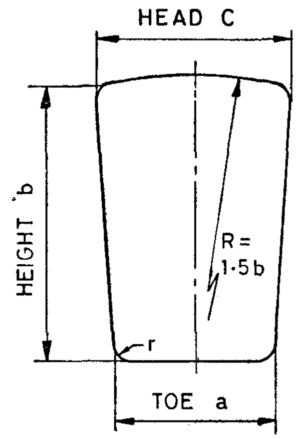

FIG. 1 CROSS-SECTION OF WIRE

9. Physical Properties

9.1 *Tensile Strength* — Tensile strength of the wire when tested in accordance with IS : 1521-1972 'Method for tensile testing of steel wire (*first revision*)', shall be 680-980 MPa (70-100 kgf/mm^2).

9.2 *Wrapping Test* — Wrapping test shall be conducted according to the method laid down in IS : 1755-1983 'Methods for wrapping test of wire (*first revision*)'. Approximately 500 mm length of wire shall be closely and tightly wound round a mandrel of diameter equal to three times the diameter of the wire and then stretched to five times the original length of the coil. After stretching and releasing, the coil shall show a uniform pitch and there shall not be any sign of crack on the inner or outer face of the wire.

9.3 *Micro-Structure* — Micro structure of the wire shall be fully spheriodized.

9.4 *Decarburization* — The wire shall be free from any total decarburized zones. The partial decarburization as indicated by a network of ferrite shall not exceed 3 percent of the cross section being examined.

10. Condition of Delivery — The wire shall be generally supplied in the form of one continuous length, properly coiled. The wire shall not be kinked and wavy. The mass of the coils, the eye dimensions and other forms of supply shall be mutually agreed to between the purchaser and the manufacturer.

10.1 Unless otherwise specified by the purchaser, the wire shall be supplied in phosphated and/or oiled condition.

11. Sampling — Unless otherwise agreed to, the method of drawing representative of the material and the criteria for conformity shall be as given in **11.1** to **11.4.**

11.1 *Lot* — In any consignment, all the coils of wires of the same grade and diameter, manufactured under essentially similar conditions, shall be grouped together to constitute a lot. Samples shall be taken from each lot and tested for conformity to the standard.

11.2 The number of coils to be taken from a lot shall be according to col 1 and 2 of Table 2. These samples shall be taken at random by using random number tables (*see* IS : 4905-1968 Methods for random sampling).

TABLE 2 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES

No. of Coils in a Lot (1)	No. of Coils for Physical Requirements (2)	Permissible No. of Defective Coils (3)	No. of Tests for Chemical Requirements (4)
Up to 25	2	0	1
26 to 50	3	0	1
51 „ 150	5	0	2
151 „ 300	8	1	2
301 and above	13	1	2

11.3 *Preparation of Samples and Number of Tests*

11.3.1 *Tests for physical requirements* — From the coils selected from col 1 and 2 of Table 2, adequate length of test piece shall be cut from each end and subjected to physical tests, namely, size, surface condition, tensile, wrapping dead wire, deep etch and decarburization tests. A test piece failing to meet any one of the requirements shall be called a defective; if the number of defectives found is less than or equal to the permissible number of defectives specified in col 3 of Table 2. The lot shall be considered to have conformed to physical requirements.

11.3.2 *Tests for chemical requirements*—Unless otherwise agreed, the following procedure shall be followed for chemical requirements:

From those test pieces which have conformed to physical requirements, further test pieces shall be selected at random according to col 4 of Table 2. These samples shall be tested for all the chemical requirements. If the test piece fails to meet the respective chemical requirements, it shall be called a defective. The lot shall be considered to have conformed to the chemical requirements if all the individual test pieces tested for chemical requirements pass the test.

11.4 *Criteria for Conformity*

11.4.1 A lot shall be considered to have conformed to the requirements of the specification if **11.3.1** and **11.3.2** are satisfied.

12. Packing and Marking — The packing of the material shall be done in such a way that corrosion does not attack the material during transit. The suitable mode of packing should be mutually agreed to between the purchaser and the manufacturer.

12.1 Each coil of the wire shall be legibly marked with the following information:

a) Name of the manufacturer,
b) Wire quality,
c) Wire diameter, and
d) Cast or batch.

12.2 *Standard Marking* — Details available with the Bureau of Indian Standards.

EXPLANATORY NOTE

Steel for spring washers is covered by IS : 4072-1975 'Specification for steel for spring washers (*first revision*)' which specifies requirements of chemical composition, method of manufacture of steel and the delivery conditions, etc, but does not specify the dimensional details, mechanical properties and the tests to be carried out on the wrought products from which spring washers are to be manufactured.

Coiled spring washers are generally manufactured from wires having a variety of cross-sections but most common of them are round square, rectangular and trapezoidal cross sections. While the mechanical properties, dimensional requirements, tolerances and physical tests of round steel spring wires are covered in IS : 4454 'Specification for steel wires for cold formed springs: Part 1-1981 Patented and cold drawn steel wires — unalloyed (*second revision*)', Part 2-1975 'Oil hardened and tempered spring steel wire and valve spring wire — unalloyed (*first revision*)', Part 3-1975 'Oil hardened and tempered steel wires — alloyed (*first revision*)', and Part 4-1974 'Stainless spring steel wire for normal corrosion resistance (*first revision*)', the requirements of other cross-sections have not yet been covered by any standard.

This standard has been prepared to cover the dimensional and other requirements of spring wires having trapezoidal cross-sections, in various sizes for the manufacture of single coil and double coil spring washers covered by IS : 3063-1972 'Specification for single coil rectangular section spring washers for bolts, nuts and screws (*first revision*)' and IS : 6755-1980 'Specification for double coil helical spring washers (*first revision*)'.

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